

GENERAL NOTES

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NOTE ON THE DISCOVERY OF THE LARVA OF *CUCULLIA SIMILARIS* (NOCTUIDAE, CUCULLIINAE)

Additional key words: *Cucullia montanae*, *Cucullia asteroides*, *Chrysothamnus*, *Grindelia*, *Aster*.

During the period 20 July–20 August 1992, we had the opportunity to examine some aspects of the flora and entomological fauna of the western part of the USA. As a result, we discovered, in the eastern suburbs of Provo (Utah), two bright colored (yellow-green) larvae, in the last instar, basking in sunlight and feeding on gray rabbitbrush, *Chrysothamnus nauseosus* (Pall. ex. Pursh.) Britt. (Asteraceae). Initially, it appeared evident that these larvae belonged to the Cuculliinae subfamily, because of some resemblance to the European species *Cucullia asteris* Denis & Schiffermüller. Furthermore, they also look like the American *Cucullia* species of the *asteris* group whose larvae have been identified, such as *Cucullia asteroides* Guenée (Dethier 1944, Crumb 1956, Stehr 1987, Poole 1995), *Cucullia montanae* Grote. (Crumb 1956, Poole 1995) or *Cucullia postera* Guenée subspecies *omissa* (Crumb 1956) but, according to Poole (1995), misidentified: the described larvae corresponding rather to a mixture of *Cucullia florea* Guenée, *Cucullia postera* Guenée and *Cucullia obscurior* Smith.

In the following days the same species was collected again, first, on *Chrysothamnus nauseosus* near of the Timpanogos caves (Utah) and near Silver Lake (Oregon), and second, on Douglas rabbitbrush *Chrysothamnus viscidiflorus* (Hook.) Nutt. (Asteraceae) (Munz & Keck 1973) near Cedar City (Utah).

The description of *C. montanae* Grote given by Crumb (1956) from larvae collected on *Grindelia species* (Asteraceae) in western Washington is not consistent with the larvae collected by us in Utah and Oregon on *Chrysothamnus* sp. However, Cook (1935) has indicated in his Montana list that he collected some *C. montanae* larvae on *Chrysothamnus* sp. at Three Forks and Hamilton (Montana); his short description “a green and white striped worm” does not exactly fit that of Crumb (1956), nor that of the species found by us on *Chrysothamnus* sp.

Identification of the larvae collected on *Chrysothamnus* sp. Assuming that at least two different *Cucullia* species can live on *Chrysothamnus* and *Grindelia*, we decided to search *Grindelia squarrosa* (Pursh) Dunal for the presence of a second larva. Unfortunately, we have not been able to discover any larvae on this plant in Utah during the period of 20 July to 20 August 1992. Consequently, we decided to wait

for the eclosion of the adults in order to identify the species collected on *Chrysothamnus*. Several adults eclosed in July 1993 suggesting that this species is one-brooded. At that time the only available drawings of the adults were those presented by Hampson (1906) and Seitz (1919–1944). They did not allow us to clearly distinguish between *C. similaris* and *C. montanae*.

In 1993, Dr. J. D. Lafontaine (Agriculture Canada, Ottawa) kindly supplied us very precise information on the habitus and the genitalia of the closely related *C. similaris* and *C. montanae*. It became clear after examination of the imago and of the male genitalia that the species living on *Chrysothamnus* in Utah and Oregon was *C. similaris* (*C. similaris* always showing the presence of a single large cornutus in the vesica instead of generally two differently sized cornuti in *C. montanae*). Later, this was unambiguously confirmed with the appearance of Poole's book (1995) which gives, not only good color and black and white photographs of adults and both male and female genitalia, but also very interesting maps of distribution for these two species. For instance, the latter show that *C. similaris* is more frequently recorded in Utah than *C. montanae* (for the latter species a single data point on the distribution map indicates that this species is probably not very common in this state). Our records of *C. similaris* in Utah and Oregon are consistent with these distribution maps.

Description of *Cucullia similaris* larva. The full grown larvae are about 40 mm long; head whitish green with two darker shades running across; conspicuous frontal triangle blue green; at moderate magnification numerous small light freckles are visible (Fig. 1). The ground color is green. The main features of this larva are a set of conspicuous longitudinal yellow, green and white stripes (Figs. 2, 3). The middorsal, nearly continuous bright yellow stripe is superimposed on a larger white stripe overflowing on each side. Between this white stripe and the spiracles there is a set of five stripes: the first and fifth have a dark green color and are partially bordered by traces of thin black lines (only visible at moderate magnification; Fig. 4). The third stripe appears lighter green than the other two. The second and fourth stripes are bright yellow (bordered by white in the upper part) and white, respectively. The spiracles, which are cream encircled with black, are connected to the traces of black lines located at the ventral border of the fifth stripe (dark green). Under the spiracles there is a broad festooned yellow stripe, which is followed by a white stripe.

Description of *Cucullia montanae* larva. From the description by Crumb (1956), *C. montanae* larva appears, at first glance, of a green ground color with conspicuous longitudinal black lines. The greenish white head is strongly marked with large black freckles. The spiracles are white. “A bright yellow continuous middorsal



FIGS. 1-9. Larvae of *Cucullia*; ordered sequentially from left to right, top to bottom. 1, Enlarged head of *Cucullia similaris* larva (last instar), (VIII-1992), vicinity of Timpanogos caves (Utah). 2, *Cucullia similaris* (lateral view) penultimate instar on *Chrysothamnus nauseosus* (VIII-1992), vicinity of Timpanogos caves (Utah). 3, *Cucullia similaris* (dorsal view) penultimate instar on *Chrysothamnus nauseosus* (VIII-1992) vicinity of Timpanogos caves (Utah). 4, *Cucullia similaris*; enlarged view of Fig. 2. 5, *Cucullia montanae* (lateral view), last instar on *Grindelia integrifolia*, green form (IX-2002), shore of Hood canal (western Washington). 6, *Cucullia montanae* (dorsal view), last instar on *Grindelia integrifolia*, green form (IX-2002), shore of Hood canal (western Washington). 7, *Cucullia montanae*; enlarged view of Fig. 5. 8, *Cucullia montanae* larva (lateral view), last instar photographed on *Aster* sp., pink form (IX-2002), shore of Hood canal (western Washington). 9, *Cucullia montanae*; enlarged view of Fig. 5.

stripe and a broad subventral stripe yellow dorsally and white on ventral third" are present. Between these two yellow stripes there is a set of "3 longitudinal darker stripes, the median lighter than the others, all bordered by black lines which tend, in the darker stripes, to be broadened about midway of each segment." However, Crumb does not indicate the exact color of these three stripes (presumably green), and that of the associated two spaces, preventing us from having a clear idea of the appearance of this species.

In the second fortnight of September 2002, following the information given by Crumb (1956) we collected some *C. montanae* larvae in western Washington, upon a salt-tolerant *Grindelia* determined later with the help of the book of Hitchcock et al. (1955), as *Grindelia integrifolia* D.C. (Asteraceae). Figures 5–9 show the two chromatic forms of the larva: green and pink. The three stripes are green as expected (or pink), whereas, the two spaces (Figs. 5–9) between these stripes are bright yellow and dirty white, respectively; i.e., nearly of the same colors encountered for stripes 2 and 4 in *C. similis* larvae. In some cases, the dirty white stripe is partially or totally invaded by the ground color especially by the pink ground color, which sometimes also partially invades the yellow stripes and the spiracles (Fig. 8). An unique specimen of *C. montanae* larva has been collected upon a salt-tolerant *Aster* sp. (Asteraceae) and bred on this plant which appears as an occasional food plant. R. W. Poole (1995) indicates, in a comment of his map of distribution, that *C. montanae* is more commonly found in dry places and at moderate elevations (7000–8000 feet, ~2130–2440 m). It seems this is more likely connected to xerothermic preferences of the food plants as for instance the resin weed (*Grindelia squarrosa*), rather than that of the moths themselves (since the larvae collected by Crumb, like those collected by us, have been found at sea level).

In captivity, *C. montanae* larvae have accepted seeds of *Chrysothamnus viscidiflorus*, showing this species is clearly oligophagous. The latter result makes the observation by Cook (1935) more credible. However, until now, no *C. montanae* larvae have been found either on *Chrysothamnus* sp. or on *Grindelia* sp. in Central Washington in the second fortnight of September. This may be because of inadequate period of collection in this drier and warmer region than western Washington. Further discussion is unwarranted before obtaining new data.

Comparison of the larvae of *Cucullia similis* with the nearest species: *Cucullia montanae* and *Cucullia asteroides*. From the descriptions of *C. asteroides* larva given by Crumb (1956), Dethier (1944), Stehr (1987), Poole (1995), the drawings of Dethier (1944) and the black and white photograph of Stehr (1987) and our own photographs of the two species *C. similis* and *C. montanae* larvae, the following remarks can be made. The larvae of the three species have in common: (1) the presence of an almost continuous middorsal yellow stripe, and between this stripe and the spiracles there is a set of five stripes which are green, yellow or white; (2) the presence of two broad yellow and white subspiracular stripes; and (3) the spiracles are of a light color encircled with black.

Cucullia similis larvae may be distinguished from the other two species by the nearly complete absence of black lines at the borders of the five stripes lying between the middorsal yellow stripe and the spiracles (traces of black lines are only visible under moderate magnification on the borders of the darker green stripes 1 and 5; Fig. 4). On the other hand, six black lines bordering the five lateral stripes are visible to the

naked eye in *C. montanae* (conspicuous continuous lines) and in *C. asteroides* larvae (more or less interrupted lines).

The black markings (resulting of the broadening of two black lines), are completely absent in *C. similis* larvae. These markings are present only in the subdorsal region in *C. montanae* larvae, while in *C. asteroides* they are larger in size in the subdorsal region and are also present in the spiracular stripe, around the spiracles.

In addition, in *C. similis* larvae, the yellow stripes are, at least for the middorsal and subdorsal stripes, superimposed on a white stripe overflowing on one or both sides.

Until now, only the green ground color has been observed in *C. similis* larvae, whereas the other two species have both green or pink/brown ground colors. The head of the three species is similar in the ground color but whereas *C. similis* larvae have inconspicuous numerous light freckles (only visible at moderate magnification), *C. asteroides* larvae have small brown freckles and *C. montanae* larvae display strong large black freckles.

Although the discrimination between *C. montanae* and *C. asteroides* larvae is mainly obtained by comparison of the extension of the black lines and markings, other differences in the latter two species may be evidenced. They are, according to Crumb (1956), the presence in *C. montanae* larvae, in the bluish green (or pink) venter, of a faint "black line along the base of prolegs" (becoming double between the prolegs; Fig. 9), and in the midventer of traces of two black lines, whereas in *C. asteroides* larvae the venter is also green (or brown) "with traces of a white stripe in the line of spiracles".

The clues given by Crumbs (1956) and Poole (1995) based on the data of Cook (1931) considering *Chrysothamnus nauseosus* as a host plant for *C. montanae* need further verifications. *Cucullia similis* larva and, at least, two of its food plants must be regarded as well known, now more than a century after the description of this species by Smith.

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NOTES ON THE COMMON PALM BUTTERFLY, *ELYMNIAS HYPERMNESTRA UNDULARIS* (DRURY) (SATYRINAE) IN INDIA

Additional key words: Genitalia, toothed brachia, angular appendices, signa, genital plate.

Hemming (1967) clarified that *E. jynx* Hübner (= *Papilio undularis* Drury) is the type-species of the genus *Elymnia* Hübner, which remained without a valid type-species for some time (Hemming 1943). Unlike other satyrines, palm butterflies often are brightly colored and generally resemble danaines, which they mimic in one or both the sexes. According to Bingham (1905), Evans (1932), Talbot (1947), Pinratana (1988), and Corbet and Pendlebury (1992), the species referable to the genus *Elymnia* differ from other satyrine genera in having a hind wing predorsal cell. Of the eleven species from India, three, i.e., *E. hypermnestra* (Linnaeus), *E. malelas* (Hewitson), and *E. patna* (Westwood), have been reported from Northwest India. However, in recent surveys, only *E. hypermnestra* could be located and reexamined. This reexamination revealed that the male and female genitalia possess certain unique taxonomic characteristics. The genitalia are described here, along with remarks on the distribution of the species.

Elymnia hypermnestra undularis (Drury)

Male genitalia (Figs. 1–5). Uncus long, slightly curved, longer than tegumen, distal end sharply pointed; brachia very thin, long, slender, upwardly turned, distal end with minute teeth, strongly sclerotized; tegumen broader dorsally, narrower ventrally; appendices angulares long, broad proximally, narrow, hooked distally; vin-

NOTE ADDED IN PRESS: While this manuscript was in press we have collected the following additional information. First, a photo showing the green form of *Cucullia montanae*'s larva upon *Grindelia integrifolia* D.C. taken by Jeremy B. Tatum, B.C., Canada, is available on the web site entitled "Butterflies and moths of Southern Vancouver Island" at the address: <http://alpha.furman.edu/~snyder/snyder/lep/intern.htm>. This is, to our knowledge, the first photograph of *Cucullia montanae*'s larva ever published. It also confirms the identity of the main food-plant. Second, according to M. Hreblay and L. Ronkay: "The palearctic *Cucullia ledereri* Staudinger 1892, known from Kamchatka by its holotype female only", has for "closest relative *Cucullia similaris* 1892, they may represent two different populations of the same species!" This quote is from Moths of Nepal. Part 5. Tinea. Vol. 15 (supplement), pp. 174–175. In Tashiro Haruta (ed.). The Japan Heterocerist's Society, Tokyo, 1998. A similar view concerning the relationship between the two species is given in the Illustrated catalogue of Noctuidae in Korea by V. S. Kononenko, S. B. Ahn, L. Ronkay, Insects of Korea, Series 3, Park Kyu-Tek, Korea 1998. It will be interesting to find the male and the larva of *Cucullia ledereri* in order to know if they show any significant differences with *Cucullia similaris*.

culum much longer than tegumen, slightly curved inwardly, broader in the middle; saccus short, tubular, distal end rounded; valva somewhat boat-shaped, costa and sacculus not demarcated, harpe strongly sclerotized, narrow, knife-like, with inner margin dentate, pilose; juxta squarish plate-like, weakly sclerotized; aedeagus tubular, slightly squeezed in the middle, subzone smaller than suprazone, ductus ejaculatorius entering dorsad.

Female genitalia (Figs. 7, 8). Corpus bursae cylindrical, membranous; signa represented by two scobinate patches which run along whole length of corpus bursae; ductus bursae moderately long, broader anteriorly, narrower posteriorly; ductus seminalis originate from ductus bursae near base of corpus bursae; central process of lamella antevaginalis very small, roughly triangular, lateral flaps long, membranous except on their inner margin; lamella postvaginalis reduced, with small oval plates; apophyses anterioris wanting; apophyses posterioris moderately long, slender, membranous; papilla analis guttiform, pilose.

Length of forewing. Male: 34.0–36.0 mm (n = 10); Female: 40.0–42.0 mm (n = 5).

Material examined. Himachal Pradesh: 4 ♂, 3 ♀, 1.xi.91, Paonta Sahib, 850 m, Sirmaur. Assam: 2 ♂, 2 ♀, 8.v.95, Vasistha, 213 m, Guwahati. Sikkim: 2 ♂, 30.ix.95, Rangpo, 600 m; 2 ♀, 4.x.95, Jorethang, 630 m.

Remarks. Among fifty-four satyrine species for which the male genitalia have been examined, certain structures, such as toothed brachia and angular appendices, are unique to *E. hypermnestra*. Similarly, the female genitalia have a unique signa and genital plate, both conspicuous structures not encountered in any other satyrine examined so far. The account of the male and the female genitalia are described for the first time.